



[4910-13]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 25

[Docket No. FAA-2015-5878; Special Conditions No. 25-608-SC]

Special Conditions: Dassault Aviation, Model Falcon 2000EX Airplanes, Head-Up Display (HUD) with Vision-System Video

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final special conditions; request for comments.

SUMMARY: These special conditions are issued for Dassault Aviation Model Falcon 2000EX airplanes. This airplane will have a novel or unusual design feature associated with a vision system that displays video imagery on the head-up display (HUD). The applicable airworthiness regulations do not contain adequate or appropriate safety standards for this design feature. These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

DATES: This action is effective on Dassault Aviation on **[INSERT DATE OF PUBLICATION IN THE FEDERAL REGISTER]**. We must receive your comments by **[INSERT DATE 45 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER]**.

ADDRESSES: Send comments identified by docket number FAA-2015-5878 using any of the following methods:

- *Federal eRegulations Portal:* Go to <http://www.regulations.gov/> and follow the online instructions for sending your comments electronically.

- *Mail:* Send comments to Docket Operations, M-30, U.S. Department of Transportation (DOT), 1200 New Jersey Avenue, SE., Room W12-140, West Building Ground Floor, Washington, DC, 20590-0001.
- *Hand Delivery or Courier:* Take comments to Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.
- *Fax:* Fax comments to Docket Operations at 202-493-2251.

Privacy: The FAA will post all comments it receives, without change, to <http://www.regulations.gov/>, including any personal information the commenter provides. Using the search function of the docket Web site, anyone can find and read the electronic form of all comments received into any FAA docket, including the name of the individual sending the comment (or signing the comment for an association, business, labor union, etc.). DOT's complete Privacy Act Statement can be found in the Federal Register published on April 11, 2000 (65 FR 19477-19478), as well as at <http://DocketsInfo.dot.gov/>.

Docket: Background documents or comments received may be read at <http://www.regulations.gov/> at any time. Follow the online instructions for accessing the docket or go to Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE, Washington, D.C., between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

FOR FURTHER INFORMATION CONTACT: Dale Dunford, FAA, Airplane and Flightcrew Interface, ANM-111, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Avenue SW., Renton, Washington 98057-3356; telephone 425-227-2239; facsimile 425-227-1100.

SUPPLEMENTARY INFORMATION:

The FAA has determined that notice of, and opportunity for prior public comment on, these special conditions are impracticable because these procedures would significantly delay issuance of the design approval and thus delivery of the affected airplane. In addition, the substance of these special conditions has been subject to the public-comment process in several prior instances with no substantive comments received. The FAA therefore finds that good cause exists for making these special conditions effective upon publication in the **Federal Register**.

Comments Invited

We invite interested people to take part in this rulemaking by sending written comments, data, or views. The most helpful comments reference a specific portion of the special conditions, explain the reason for any recommended change, and include supporting data.

We will consider all comments we receive by the closing date for comments. We may change these special conditions based on the comments we receive.

Background

On September 24, 2012, the European Aviation Safety Agency (EASA), on behalf of Dassault Aviation, applied for a design change to type certificate no. A50NM to install the Elbit Systems head-up display, which is an enhanced-flight vision system (EFVS) and synthetic vision system (SVS). The change includes the display of a vision-system video on the HUD.

Video display on the HUD constitutes new and unusual technology for which the FAA has no certification criteria. Title 14, Code of Federal Regulations (14 CFR) 25.773 does not permit visual distortions and reflections in the pilot's view out the airplane windshield that could interfere with the pilot's normal duties, and was not written in anticipation of such technology. Special conditions are therefore issued as prescribed under the provisions of § 21.16.

Type Certification Basis

Under the provisions of 14 CFR 21.101, Dassault Aviation must show that the Model Falcon 2000EX airplane, as changed, continues to meet the applicable provisions of the regulations listed in type certificate no. A50NM, or the applicable regulations in effect on the date of application for the change, except for earlier amendments as agreed upon by the FAA. The regulations listed in the type certificate are commonly referred to as the “original type certification basis.” The regulations listed in type certificate no. A50NM are as follows:

14 CFR part 25, effective February 1, 1965, including the latest applicable requirements of Amendments 25-1 through 25-98. In addition, the certification basis includes certain special conditions, exemptions, or later amended sections of the applicable part that are not relevant to these special conditions.

If the Administrator finds that the applicable airworthiness regulations (i.e., 14 CFR part 25) do not contain adequate or appropriate safety standards for the Model Falcon 2000EX airplane because of a novel or unusual design feature, special conditions are prescribed under the provisions of § 21.16.

Special conditions are initially applicable to the model for which they are issued. Should the type certificate for that model be amended later to include any other model that incorporates the same novel or unusual design feature, or should any other model already included on the same type certificate be modified to incorporate the same novel or unusual design feature, these special conditions would also apply to the other model under § 21.101.

In addition to the applicable airworthiness regulations and special conditions, the Dassault Aviation Model Falcon 2000EX airplane must comply with the fuel-vent and exhaust-emission requirements of 14 CFR part 34, and the noise-certification requirements of 14 CFR

part 36.

The FAA issues special conditions, as defined in 14 CFR 11.19, in accordance with § 11.38, and they become part of the type-certification basis under § 21.101.

Novel or Unusual Design Features

The Model Falcon 2000EX airplane will incorporate the following novel or unusual design feature:

Enhanced-flight vision system and synthetic vision system that display video imagery on a HUD.

Discussion

For many years the FAA has approved, on transport-category airplanes, the use of HUD that display flight symbols without a significant visual obstruction of the outside view. When the FAA began to evaluate the display of enhanced vision-system (EVS) imagery on the HUD, significant potential to obscure the outside view became apparent, contrary to the requirements of 14 CFR 25.773. This rule does not permit distortions and reflections in the pilot-compartment view, through the airplane windshield, that interferes with normal duties, and the rule was not written in anticipation of such technology. The video image potentially interferes with the pilot's ability to see the natural scene in the center of the forward field of view. Therefore, the FAA issued special conditions for such HUD/EVS installations to ensure that the level of safety required by § 25.773 would be met even when the image might partially obscure the outside view. While many of the characteristics of EVS and SVS video differ in some ways, they have one thing in common: the potential for interference with the outside view through the airplane windshield.

Although the pilot readily may be able to see around and through small, individual,

stroke-written symbols on the HUD, the pilot may not be able to see, without some interference of the outside view, around or through the image that fills the display. Nevertheless, the vision-system video may be capable of meeting the required level of safety when considering the combined view of the image and the outside scene visible to the pilot through the image. It is essential that the pilot can use this combination of image and natural view of the outside scene as safely and effectively as the pilot-compartment view currently available without the vision-system image.

Because § 25.773 does not provide for any alternatives or considerations for such a new and novel system, the FAA establishes safety requirements that assure an equivalent level of safety and effectiveness of the pilot-compartment view as intended by that rule. The purpose of these special conditions is to provide the unique pilot-compartment-view requirements for the EFVS/SVS installation.

Applicability

As discussed above, these special conditions are applicable to the Dassault Aviation Model Falcon 2000EX airplane. Should the applicant apply at a later date for a change to the type certificate to include another model incorporating the same novel or unusual design feature, the special conditions would apply to that model as well.

Conclusion

This action affects only certain novel or unusual design features on Dassault Aviation Model Falcon 2000EX airplanes. It is not a rule of general applicability.

The substance of these special conditions has been subjected to the public notice and comment period in several prior instances, and has been derived without substantive change from those previously issued. It is unlikely that prior public comment would result in a significant

change from the substance contained herein. Therefore, because a delay would significantly affect the certification of the HUD/EVS modification to the Falcon 2000EX airplane, which is imminent, the FAA has determined that prior public notice and comment are unnecessary and impracticable, and good cause exists for adopting these special conditions upon publication in the **Federal Register**.

The FAA requests comments to allow interested persons to submit views that may not have been submitted in response to the prior opportunities for comment described above.

List of Subjects in 14 CFR Part 25

Aircraft, Aviation safety, Reporting and recordkeeping requirements.

The authority citation for these special conditions is as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701, 44702, 44704.

The Special Conditions

Accordingly, pursuant to the authority delegated to me by the Administrator, the following special conditions are issued as part of the type-certification basis for Dassault Aviation Falcon 2000EX airplanes.

1. During any phase of flight in which it is to be used, the vision-system video imagery on the HUD must not degrade flight safety or interfere with the effective use of outside visual references for required pilot tasks.
2. To avoid unacceptable interference with the safe and effective use of the pilot-compartment view, the vision system must meet the following requirements:
 - a. The vision-system design must minimize unacceptable display characteristics or artifacts (e.g., terrain shadowing against a dark background) that obscure the desired image of the scene, impair the pilot's ability to detect and identify visual

references, mask flight hazards, distract the pilot, or otherwise degrade task performance or safety.

- b. Control of vision-system display brightness must be sufficiently effective in dynamically changing background (ambient) lighting conditions to avoid pilot distraction, impairment of the pilot's ability to detect and identify visual references, masking of flight hazards, or to otherwise degrade task performance or safety. If automatic control for image brightness is not provided, it must be shown that a single, manual setting is satisfactory for the range of lighting conditions encountered during a time-critical, high-workload phase of flight (e.g., low-visibility instrument approach).
- c. A readily accessible control must be provided that permits the pilot to immediately deactivate and reactivate display of the vision-system video image on demand, without having to remove hands from the primary flight controls (yoke or equivalent) or thrust control.
- d. The vision-system video image on the HUD must not impair the pilot's use of guidance information, or degrade the presentation and pilot awareness of essential flight information displayed on the HUD, such as alerts, airspeed, attitude, altitude and direction, approach guidance, windshear guidance, TCAS resolution advisories, or unusual-attitude recovery cues.
- e. The vision-system video image and the HUD symbols, which are spatially referenced to the pitch scale, outside view, and image, must be scaled and aligned (i.e., conformal) to the external scene. In addition, the vision-system video image and the HUD symbols—when considered singly or in combination—must not be

misleading, cause pilot confusion, or increase workload. Airplane attitudes or cross-wind conditions may cause certain symbols and graphic elements (e.g., the zero-pitch line or flight-path vector) to reach field-of-view limits, such that they cannot be positioned in alignment with the image and external scene. In such cases, these symbols may be displayed but with an altered appearance (“ghosting”) that makes the pilot aware that the symbols and graphics are no longer displayed conformally. The combined use of symbols and runway image may not be used for path monitoring when path symbols are no longer conformal (i.e., in alignment with the real-world view out the airplane window).

- f. A HUD system used to display vision-system video images must, if previously certified, continue to meet all of the requirements of the original approval.
- 3. The safety and performance of the pilot tasks associated with the use of the pilot-compartment view must be not be degraded by the display of the vision-system video image. These tasks include the following:
 - a. Detection, accurate identification, and maneuvering, as necessary, to avoid traffic, terrain, obstacles, and other flight hazards.
 - b. Accurate identification and utilization of visual references required for every task relevant to the phase of flight.

4. Appropriate limitations must be stated in the Operating Limitations section of the Airplane Flight Manual to prohibit the use of vision systems for functions that have not been found to be acceptable.

Issued in Renton, Washington, on January 19, 2016.

Michael Kaszycki
Acting Manager, Transport Airplane Directorate
Aircraft Certification Service
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